Residential Radon and Lung Cancer in a High Radon Area of Gansu Province, China

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Although studies of underground miners demonstrate convincingly that exposure to radioactive radon gas and its decay products increases the risk of lung cancer (*1*), direct demonstration of excess risks from residential radon is needed to confirm the risk for residential exposures and to affirm extrapolations from the miner data. To date, some case–control studies of residential radon find no risk with indoor radon exposure, while

losis, indoor smokiness, or amount of coal use. There was heterogeneity in the EOR by type of house, with a significant trend in risk for those living in underground dwellings, but no trend for subjects living in standard above-ground dwellings or apartments. However, this heterogeneity disappeared with more detailed adjustment for smoking and with greater coverage of the exposure time window.

For subjects with 70% or greater coverage of the exposure window, the EORs at 100 Bq/m^3 adjusted for error GSDs of 1.25, 1.5 and 1.6 were 0.27 (95% CI: 0.03, 0.69), 0.32 (95% CI: 0.08, 1.37) and 0.59 (95% CI: 0.14, 2.73), respectively, in contrast to the unadjusted estimate 0.22 (95% CI: 0.06, 0.54). EOR estimates, as well as widths of the CIs, increased with the adjustments for exposure error.

Summary

Uncertainty in dosimetry can have an impact on estimates of radon effect. The estimated EOR increased after adjustment for our best estimate of exposure uncertainty by about 50%. This agrees with previous attempts at uncertainty adjustment of the EOR, which also increased estimates about 50–100% (*3, 5, 6*). In addition, three recent studies with enhanced exposure assessments found an increased risk of lung cancer (*2, 9, 10*), suggesting that radon risks may be higher than previously estimated.

In conclusion, radon concentrations in our study were high, exceeding most previous indoor studies, and the population was stable, suggesting improved accuracy in dosimetry. The overall EOR at 100 Bq/m^3 was 0.19 (0.05, 0.47). These results provide evidence that high levels of residential radon increased the risk of lung cancer and support findings from meta-analyses of indoor studies and from miners. In addition, our estimates suggest that the effects of residential radon may equal or exceed miner-based estimates, which are currently used for risk evaluation.

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